DOCUMENT RESUME

ED 285 499 HE 020 733

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TITLE Improving Your Test Questions.
INSTITUTION Illinois Univ., Urbana. Office of Instructional and Management Services.
PUB DATE [83]
NOTE 39p.; Paper identified by the Task Force on Establishing a National Clearinghouse of Materials Developed for Teaching Assistant (TA) Training.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Check Lists; College Instruction; Essay Tests; Graduate Students; Higher Education; Objective Tests; Performance Tests; Rating Scales; *Teacher Made Tests; *Teaching Assistants; *Test Construction; *Test Format; Test Items
IDENTIFIERS *Teaching Assistant Training Project; *University of Illinois Urbana Champaign

ABSTRACT

Information on the uses, advantages, and limitations of different types of test items is presented for college faculty, along with guidelines for developing test items. Included is advice on: choosing between objective and subjective test items, when essay tests or objective tests are appropriate, and when either essay or objective tests can be used. Advantages and disadvantages of using the following types of test items are identified: multiple-choice, true-false, matching, completion, essay, problem solving, and performance. Suggestions for writing each type of test items and examples are provided. In writing multiple-choice test items, consideration is given to both the stem, which identifies the question or problem, and the response alternatives. Both the extended-response and short-answer essays are covered, and suggestions for scoring essay items are included. Two methods for collecting feedback on the quality of test items are addressed: self-review and student evaluation of test item quality. A checklist for teacher evaluation of test items is provided, with sections for each type of test. The Instructor and Course Evaluation System questionnaire items for student rating of the quality of tests items are also included. (SW)

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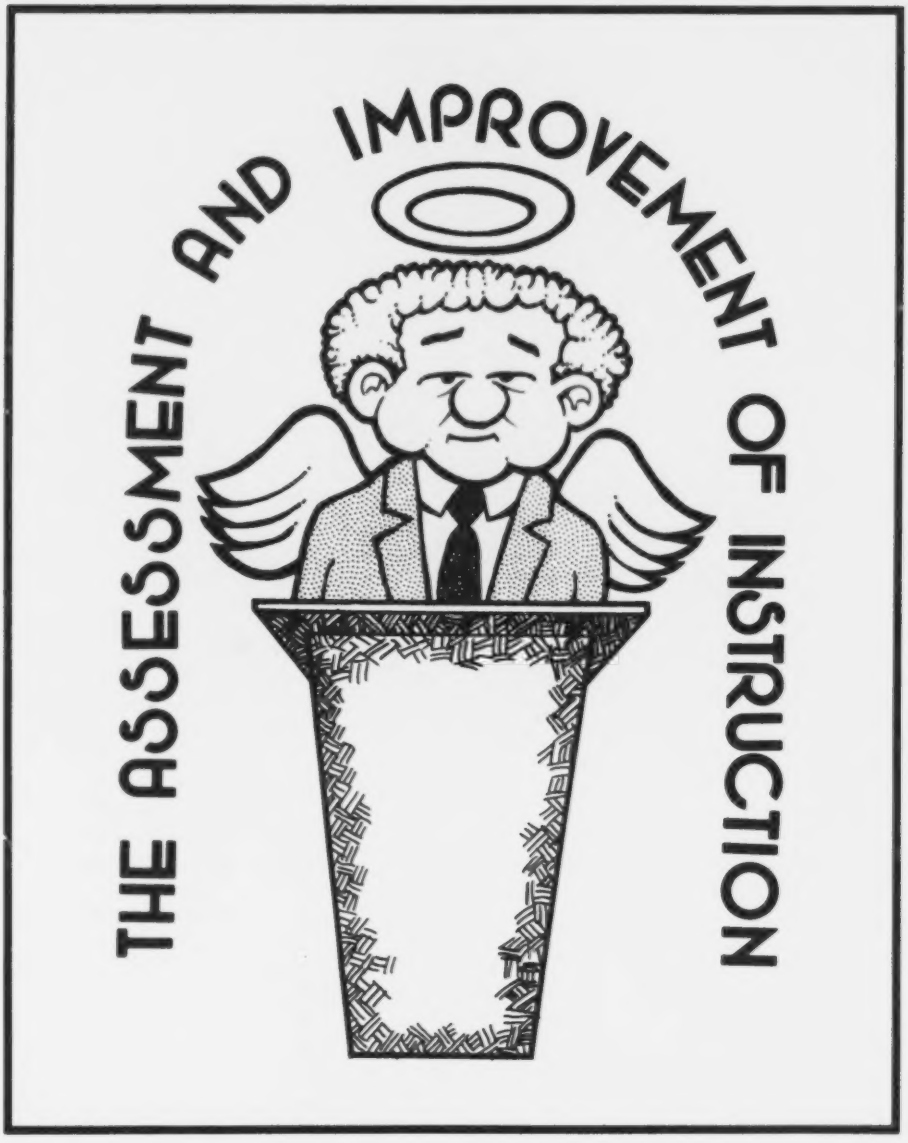

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IMPROVING YOUR TEST QUESTIONS

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IMPROVING YOUR TEST QUESTIONS

Choosing the appropriate type of test item to measure students' understanding of course material and their achievement of course goals can often be as difficult a task as writing the item themselves. The purpose of this booklet is (a) to inform you of the uses, advantages and limitations of the various item types and (b) to help you develop specific skills in writing each kind of item.

The booklet is divided into the following sections:

Page

I. Choosing Between Objective and Subjective Test Items 2

II. Suggestions for Using and Writing Test Items

- Multiple-Choice 7
- True-False 12
- Matching 15
- Completion 18
- Essay 21
- Problem Solving 25
- Performance 28

III. Two Methods for Assessing Test Item Quality 30

- Checklist for Evaluating Test Items 30
- Student Evaluation of Test Item Quality 34

IV. Assistance Offered by the Office of Instructional and Management Services (IMS) 35

V. References for Further Reading 35

I. CHOOSING BETWEEN OBJECTIVE AND SUBJECTIVE TEST ITEMS

There are two general categories of test items: (a) objective items which require students to select the correct response from several alternatives or to supply a word or short phrase to answer a question or complete a statement; and (2) subjective or essay items which permit the student to organize and present an original answer. Objective items include multiple-choice, true-false, matching and completion, while subjective items include short-answer essay, extended-response essay, problem solving and performance test items. For some instructional purposes one or the other item types may prove more efficient and appropriate. To begin our discussion of the relative merits of each type of test item, test your knowledge of these two item types by answering the following questions.

Test Item Quiz

(circle the correct answer)

1.	Essay exams are easier to construct than are objective exams.	T	F	?
2.	Essay exams require more thorough student preparation and study time than objective exams.	T	F	?
3.	Essay exams require writing skills where objective exams do not.	T	F	?
4.	Essay exams teach a person how to write.	T	F	?
5.	Essay exams are more subjective in nature than are objective exams.	T	F	?
6.	Objective exams encourage guessing more so than essay exams.	T	F	?
7.	Essay exams limit the extent of content covered.	T	F	?
8.	Essay and objective exams can be used to measure the same content or ability.	T	F	?
9.	Essay and objective exams are both good ways to evaluate a student's level of knowledge.	T	F	?

Quiz Answers

1. TRUE - Essay items are generally easier and less time consuming to construct than are most objective test items. Technically correct and content appropriate multiple-choice and true-false test items require an extensive amount of time to write and revise. For example, a professional item writer produces only 9-10 good multiple-choice items in a day's time.

2. ? - According to research findings it is still undetermined whether or not essay tests require or facilitate more thorough (or even different) student study preparation.

3. TRUE - Writing skills do affect a student's ability to communicate the correct "factual" information through an essay response. Consequently, students with good writing skills have an advantage over students who have difficulty expressing themselves through writing.

4. FALSE - Essays do not teach a student how to write but they can emphasize the importance of being able to communicate through writing. Constant use of essay tests may encourage the knowledgeable but poor writing student to improve his/her writing ability in order to improve performance.

5. TRUE - Essays are more subjective in nature due to their susceptibility to scoring influences. Different readers can rate identical responses differently, the same reader can rate the same paper differently over time, the handwriting, neatness or punctuation can unintentionally affect a paper's grade and the lack of anonymity can affect the grading process. While impossible to eliminate, scoring influences or biases can be minimized through procedures discussed later in this booklet.

6. ? - Both item types encourage some form of guessing. Multiple-choice, true-false and matching items can be correctly answered through blind guessing, yet essay items can be responded to satisfactorily through well written bluffing.

7. TRUE - Due to the extent of time required by the student to respond to an essay question, only a few essay questions can be included on a classroom exam. Consequently, a larger number of objective items can be tested in the same amount of time, thus enabling the test to cover more content.

8. TRUE - Both item types can measure similar content or learning objectives. Research has shown that students respond almost identically to essay and objective test items covering the same content. Studies[1] by Sax & Collet (1968) and Paterson (1926) conducted forty-two years apart reached the same conclusion:

> "...there seems to be no escape from the conclusions that the two types of exams are measuring identical things." (Paterson, p. 246)

This conclusion should not be surprising; afterall, a well written essay item requires that the student (1) have a store of knowledge, (2) be able to relate facts and principles, and (3) be able to organize such information into a coherent and logical written expression, whereas an objective test item requires that the student (1) have a store of knowledge, (2) be able to relate facts and principles, and (3) be able to organize such information into a coherent and logical choice among several alternatives.

9. TRUE - Both objective and essay test items are good devices for measuring student achievement. However, as seen in the previous quiz answers, there are particular measurement situations where one item type is more appropriate than the other. Following is a set of recommendations for using either objective or essay test items: (Adapted from Robert L. Ebel, Essentials of Educational Measurement, 1972, p. 144).

WHEN TO USE ESSAY OR OBJECTIVE TESTS

Essay tests are especially appropriate when:

-- the group to be tested is small and the test is not to be reused.

-- you wish to encourage and reward the development of student skill in writing.

-- you are more interested in exploring the student's attitudes than in measuring his/her achievement.

-- you are more confident of your ability as a critical and fair reader than as an imaginative writer of good objective test items.

---

[1]Gilbert Sax and LeVerne S. Collet, "An Empirical Comparison of the Effects of Recall and Multiple-Choice Tests on Student Achievement," *Journal of Educational Measurement*, vol. 5 (1968), 169-73.

Donald G. Paterson, "Do New and Old Type Examinations Measure Different Mental Functions?" *School and Society*, vol. 24. (August, 21, 1926), 246-48.

Objective tests are especially appropriate when:

-- the group to be tested is large and the test may be reused.

-- highly reliable test scores must be obtained as efficiently as possible.

-- impartiality of evaluation, absolute fairness, and freedom from possible test scoring influences (e.g., fatigue, lack of anonymity) are essential.

-- you are more confident of your ability to express objective test items clearly than of your ability to judge essay test answers correctly.

-- there is more pressure for speedy reporting of scores than for speedy test preparation.

Either essay or objective tests can be used to:

-- measure almost any important educational achievement a written test can measure.

-- test understanding and ability to apply principles.

-- test ability to think critically.

-- test ability to solve problems.

-- test ability to select relevant facts and principles and to integrate them toward the solution of complex problems.

In addition to the preceding suggestions, it is important to realize that certain item types are <u>better suited</u> than others for measuring particular learning objectives. For example, learning objectives requiring the student <u>to demonstrate</u> or <u>to show</u>, may be better measured by performance test items, whereas objectives requiring the student <u>to explain</u> or <u>to describe</u> may be better measured by essay test items. The matching of learning objective expectations with certain item types can help you select an appropriate kind of test item for your classroom exam as well as provide a higher degree of test validity (i.e., testing what is supposed to be tested). To further illustrate, several sample learning objectives and appropriate test items are provided on the following page.

Learning Objective	Most Suitable Test Item
The student will be able to categorize and name the parts of the human skeletal system.	Objective Test Item (M-C, T-F, Matching)
The student will be able to critique and appraise another student's English composition on the basis of its organization.	Essay Test Item (Extended-Response)
The student will demonstrate safe laboratory skills.	Performance Test Item
The student will be able to cite four examples of satire that Twain uses in Huckleberry Finn.	Essay Test Item (Short-Answer)

After you have decided to use either an objective, essay or both objective and essay exam, the next step is to select the kind(s) of objective or essay item that you wish to include on the exam. To help you make such a choice, the different kinds of objective and essay items are presented in the following section of this booklet. The various kinds of items are briefly described and compared to one another in terms of their advantages and limitations for use. Also presented is a set of general suggestions for the construction of each item variation.

II. MULTIPLE-CHOICE TEST ITEMS

The multiple-choice item consists of two parts: (a) the stem, which identifies the question or problem and (b) the response alternatives. Students are asked to select the <u>one</u> alternative that best completes the statement or answers the question. For example,

Sample Multiple-Choice Item

(a) *Item Stem: Which of the following is a chemical change?*

(b) *Response Alternatives:*
a. Evaporation of alcohol
b. Freezing of water
**c. Burning of oil*
d. Melting of wax

*correct response

Advantages in Using Multiple-Choice Items

Multiple-choice items can provide ...

... versatility in measuring all levels of cognitive ability.

... highly reliable test scores.

... scoring efficiency and accuracy.

... objective measurement of student achievement or ability.

... a wide sampling of content or objectives.

... a reduced guessing factor when compared to true-false items.

... different response alternatives which can provide diagnostic feedback.

Limitations in Using Multiple-Choice Items

Mutliple-choice items ...

... are difficult and time consuming to construct.

... lead an instructor to favor simple recall of facts.

... place a high degree of dependence on the student's reading ability and instructor's writing ability.

SUGGESTIONS FOR WRITING MULTIPLE-CHOICE TEST ITEMS

The Stem

1. When possible, state the stem as a direct question rather than as an incomplete statement.

   Undesirable: *Alloys are ordinarily produced by ...*

   Desirable: *How are alloys ordinarily produced?*

2. Present a definite, explicit and singular question or problem in the stem.

   Undesirable: *Psychology ...*

   Desirable: *The science of mind and behavior is called ...*

3. Eliminate excessive verbiage or irrelevant information from the stem.

   Undesirable: *While ironing her formal, Jane burned her hand accidently on the hot iron. This was due to a transfer of heat by ...*

   Desirable: *Which of the following ways of heat transfer explains why Jane's hand was burned after she touched a hot iron?*

4. Include in the stem any word(s) that might otherwise be repeated in each alternative.

   Undesirable: *In national elections in the United States the President is officially*

   a. chosen by the people.
   b. chosen by members of Congress.
   c. chosen by the House of Representatives.
   **d. chosen by the Electoral College.*

   Desirable: *In national elections in the United States the President is officially chosen by*

   a. the people.
   b. members of Congress.
   c. the House of Representatives.
   **d. the Electoral College.*

5. Use negatively stated stems sparingly. When used, underline and/or capitalize the negative word.

   Undesirable: *Which of the following is not cited as an accomplishment of the Kennedy administration?*

   Desirable: *Which of the following is NOT cited as an accomplishment of the Kennedy administration?*

Item Alternatives

6. Make all alternatives plausible and attractive to the less knowledgeable or skillful student.

What process is most nearly the opposite of photosynthesis?

Undesirable	Desirable
a. Digestion	*a. Digestion*
b. Relaxation	*b. Assimilation*
**c. Respiration*	**c. Respiration*
d. Exertion	*d. Catabolism*

7. Make the alternatives grammatically parallel with each other, and consistent with the stem.

Undesirable: *What would do most to advance the application of atomic discoveries to medicine?*

**a. Standardized techniques for treatment of patients.*
b. Train the average doctor to apply radioactive treatments.
c. Remove the restriction on the use of radioactive substances.
d. Establishing hospitals staffed by highly trained radioactive therapy specialists.

Desirable: *What would do most to advance the application of atomic discoveries to medicine?*

**a. Development of standardized techniques for treatment of patients.*
b. Training of the average doctor in application of radioactive treatments.
c. Removal of restriction on the use of radioactive substances.
d. Addition of trained radioactive therapy specialists to hospital staffs.

8. Make the alternatives mutually exclusive.

Undesirable: *The daily minimum required amount of milk that a 10 year old child should drink is*

a. 1-2 glasses.
**b. 2-3 glasses.*
**c. 3-4 glasses*
d. at least 4 glasses.

Desirable: *What is the daily minimum required amount of milk a 10 year old child should drink?*

a. 1 glass.
b. 2 glasses.
**c. 3 glasses.*
d. 4 glasses.

9. When possible, present alternatives in some logical order (e.g., chronological, most to least, alphabetical).

At 7 a.m. two trucks leave a diner and travel north. One truck averages 42 miles per hour and the other truck averages 38 miles per hour. At what time will they be 24 miles apart?

Undesirable	Desirable
a. 6 p.m.	*a. 1 a.m.*
b. 9 p.m.	*b. 6 a.m.*
c. 1 a.m.	*c. 9 a.m.*
**d. 1 p.m.*	**d. 1 p.m.*
e. 6 a.m.	*e. 6 p.m.*

10. Be sure there is only one correct or best response to the item.

Undesirable: *The two most desired characteristics in a classroom test are validity and*

a. precision.
**b. reliability.*
c. objectivity.
**d. consistency.*

Desirable: *The two most desired characteristics in a classroom test are validity and*

a. precision.
**b. reliability.*
c. objectivity.
d. standardization.

11. Make alternatives approximately equal in length.

Undesirable: *The most general cause of low individual incomes in the United States is*

**a. lack of valuable productive services to sell.*
b. unwillingness to work.
c. automation.
d. inflation.

Desirable: *What is the most general cause of low individual incomes in the United States?*

**a. A lack of valuable productive services to sell.*
b. The population's overall unwillingness to work.
c. The nation's increased reliance on automation.
d. An increasing national level of inflation.

12. Avoid irrelevant clues such as grammatical structure, well known verbal associations or connections between stem and answer.

Undesirable: (grammatical clue)

A chain of islands is called an:

*a. *archipelago.*
*b. *penisula.*
*c. *continent.*
*d. *isthmus.*

Undesirable: (verbal association clue)

The reliability of a test can be estimated by a coefficient of:

*a. *measurement.*
**b. *correlation.*
*c. *testing.*
*d. *error.*

Undesirable: (connection between stem and answer clue)

The height to which a water dam is built depends on

*a. *the length of the reservoir behind the dam.*
*b. *the volume of water behind the dam.*
**c. *the height of water behind the dam.*
*d. *the strength of the reinforcing wall.*

13. Use at least four alternatives for each item to lower the probability of getting the item correct by guessing.

14. Randomly distribute the correct response among the alternative positions throughout the test having approximately the same proportion of alternatives a, b, c, d and e as the correct response.

15. Use the alternatives "none of the above" and "all of the above" sparingly. When used, such alternatives should occasionally be used as the correct response.

TRUE-FALSE TEST ITEMS

A true-false item can be written in one of three forms: simple, complex, or compound. Answers can consist of only two choices (simple), more than two choices (complex), or two choices plus a conditional completion response (compound). An example of each type of true-false item follows:

Sample True-False Item: Simple

The acquisition of morality is a developmental process. *True* *False*

Sample True-False Item: Complex

The acquisition of morality is a developmental process. *True* *False* *Opinion*

Sample True-False Item: Compound

The acquisition of morality is a developmental process.
If this statement is false, what makes it false? *True* *False*

_____

_____

Advantages in Using True-False Items

True-false items can provide ...

... the widest sampling of content or objectives per unit of testing time.

... scoring efficiency and accuracy.

... versatility in measuring all levels of cognitive ability.

... highly reliable test scores.

... an objective measurement of student achievement or ability.

Limitations in Using True-False Items

True-false items ...

... incorporate an extremely high guessing factor. For simple true-false items, each student has a 50/50 chance of correctly answering the item without any knowledge of the item's content.

... can often lead an instructor to write ambiguous statements due to the difficulty of writing statements which are unequivocally true or false.

... do not discriminate between students of varying ability as well as other item types.

... can often include more irrelevant clues than do other item types.

... can often lead an instructor to favor testing of trivial knowledge.

SUGGESTIONS FOR WRITING TRUE-FALSE TEST ITEMS

1. Base true-false items upon statements that are absolutely true or false, without qualifications or exceptions.

   Undesirable: *Nearsightedness is hereditary in origin.*

   Desirable: *Geneticists and eye specialists believe that the predisposition to nearsightedness is hereditary.*

2. Express the item statement as simply and as clearly as possible.

   Undesirable: *When you see a highway with a marker that reads, "Interstate 80" you know that the construction and upkeep of that road is built and maintained by the state and federal government.*

   Desirable: *The construction and maintenance of interstate highways is provided by both state and federal governments.*

3. Express a single idea in each test item.

   Undesirable: *Water will boil at a higher temperature if the atmospheric pressure on its surface is increased and more heat is applied to the container.*

   Desirable: *Water will boil at a higher temperature if the atmospheric pressure on its surface is increased.*

   and/or

   Water will boil at a higher temperature if more heat is applied to the container.

4. Include enough background information and qualifications so that the ability to respond correctly to the item does not depend on some special, uncommon knowledge.

   Undesirable: *The second principle of education is that the individual gathers knowledge.*

   Desirable: *According to John Dewey, the second principle of education is that the individual gathers knowledge.*

5. Avoid lifting statements from the text, lecture or other materials so that memory alone will not permit a correct answer.

   Undesirable: *For every action there is an opposite and equal reaction.*

   Desirable: *If you were to stand in a canoe and throw a life jacket forward to another canoe, chances are your canoe would jerk backward.*

6. Avoid using negatively stated item statements.

   Undesirable: *The Supreme Court is not composed of nine justices.*

   Desirable: *The Supreme is composed of nine justices.*

7. Avoid the use of unfamiliar vocabulary.

   Undesirable: *According to some politicians, the raison d'etre for capital punishment is retribution.*

   Desirable: *According to some politicians, justification for the existence of capital punishment is retribution.*

8. Avoid the use of specific determiners which would permit a test-wise but unprepared examinee to respond correctly. Specific determiners refer to sweeping terms like "all," "always," "none," "never," "impossible," "inevitable," etc. Statements including such terms are likely to be false. On the other hand, statements using qualifying determiners such as "usually," "sometimes," "often," etc., are likely to be true. When statements do require the use of specific determiners, make sure they appear in both true and false items.

   Undesirable: *All sessions of Congress are called by the President. (F)*

   The Supreme Court is frequently required to rule on the constitutionality of a law. (T)

   An objective test is generally easier to score than an essay test. (T)

   Desirable: (When specific determiners are used reverse the expected outcomes.)

   The sum of the angles of a triangle is always 180°. (T)

   Each molecule of a given compound is chemically the same as every other molecule of that compound. (T)

   The galvanometer is the instrument usually used for the metering of electrical energy used in a home. (F)

9. False items tend to discriminate more highly than true items. Therefore, use more false items than true items (but no more than 15% additional false items).

MATCHING TEST ITEMS

In general, matching items consist of a column of *stimuli* presented on the left side of the exam page and a column of *responses* placed on the right side of the page. Students are required to match the response associated with a given stimulus. For example,

Sample Matching Test Item

Directions: On the line to the left of each factual statement, write the letter of the principle which bests explains the statement's occurence. Each principle may be used more than once.

Factual Statements	*Principles*
___1. *Fossils of primates first appear in the Cenozoic rock strata, while trilobite remains are found in the Protorozoic rocks.*	a. *There have been profound changes in the climate on earth.*
___2. *The Arctic and Antarctic regions are sparsely populated.*	b. *Coordination and integration of action is generally slower in plants than in animals.*
___3. *Plants have no nervous system.*	c. *There is an increasing complexity of structure and functions from lower to higher forms of life.*
___4. *Large coal beds exist in Alaska.*	d. *All life comes from life and produces its own kind of living organisms.*
	e. *Light is a limiting factor to life.*

Advantages in Using Matching Items

Matching items ...

... require short periods of reading and response time, allowing you to cover more content.

... provide objective measurement of student achievement or ability.

... provide highly reliable test scores.

... provide scoring efficiency and accuracy.

Limitations in Using Matching Items

Matching items ...

... have difficulty measuring learning objectives requiring more than simple recall of information.

... are difficult to construct due to the problem of selecting a common set of stimuli and responses.

SUGGESTIONS FOR WRITING MATCHING TEST ITEMS

1. **Include directions which clearly state the basis for matching the stimuli with the responses. Explain whether or not a response can be used more than once and indicate where to write the answer.**

   Undesirable: *Directions: Match the following.*

   Desirable: *Directions: On the line to the left of each identifying location and characteristics in Column I, write the letter of the country in Column II that is best defined. Each country in Column II may be used more than once.*

2. **Use only homogeneous material in matching items.**

   Undesirable: *Directions: Match the following.*

1. ___ Water	*A. NaCl*
2. ___ Discovered Radium	*B. Fermi*
3. ___ Salt	*C. NH_3*
4. ___ Year of the 1st Nuclear Fission by Man	*D. H_2O*
	E. 1942
5. ___ Ammonia	*F. Curie*

   Desirable: *Directions: On the line to the left of each compound in Column I, write the letter of the compound's formula presented in Column II. Use each formula only once.*

Column I	*Column II*
1. ___ Water	*A. H_2SO_4*
2. ___ Salt	*B. HCl*
3. ___ Ammonia	*C. NaCl*
4. ___ Sulfuric Acid	*D. H_2O*
	E. H_2HCl

3. Arrange the list of responses in some systematic order if possible (e.g., chronological, alphabetical).

Directions: On the line to the left of each definition in Column I, write the letter of the defense mechanism in Column II that is described. Use each defense mechanism only once.

	Undesirable	Desirable
Column I	*Column II*	
___ 1. *Hunting for reasons to support one's beliefs.*	a. *Rationalization*	a. *Denial of reality*
___ 2. *Accepting the values and norms of others as one's own even when they are contrary to previously held values.*	b. *Identification*	b. *Identification*
___ 3. *Attributing to others one's own unacceptable impulses, thoughts and desires.*	c. *Projection*	c. *Introjection*
___ 4. *Ignoring disagreeable situations, topics, sights.*	d. *Introjection*	d. *Projection*
	e. *Denial of Reality*	e. *Rationalization*

4. Avoid grammatical or other clues to the correct response.

Undesirable: *Directions: Match the following in order to complete the sentences on the left.*

___ 1. *Igneous rocks are formed*	A. *a hardness of 7.*
___ 2. *The formation of coal requires*	B. *with crystalline rock.*
___ 3. *A geode is filled*	C. *a metamorphic rock.*
___ 4. *Feldspar is classified as*	D. *heat and pressure.*
	E. *through the solidification of molten lava.*

Desirable: *Avoid sentence completion due to grammatical clues.*

5. Keep matching items brief, limiting the list of stimuli to under 10.

6. Include more responses than stimuli to help prevent answering through the process of elimination.

7. When possible, reduce the amount of reading time by including only short phrases or single words in the response list.

COMPLETION TEST ITEMS

The completion item requires the student to answer a question or to finish an incomplete statement by filling in a blank with the correct word or phrase. For example,

Sample Completion Item

According to Freud, personality is made up of three major systems, the _____, *the* _____ *and the* _____.

Advantages in Using Completion Items

Completion items ...

... can provide a wide sampling of content.

... can efficiently measure lower levels of cognitive ability.

... can minimize guessing as compared to multiple-choice or true-false items.

... can usually provide an objective measure of student achievement or ability.

Limitations in Using Completion Items

Completion items ...

... are difficult to construct so that the desired response is clearly indicated.

... have difficulty measuring learning objectives requiring more than simple recall of information.

... can often include more irrelevant clues than do other item types.

... are more time consuming to score when compared to multiple-choice or true-false items.

... are more difficult to score since more than one answer may have to be considered correct if the item was not properly prepared.

SUGGESTIONS FOR WRITING COMPLETION TEST ITEMS

1. Omit only significant words from the statement.

   Undesirable: *Every atom has a central __(core)__ called a nucleus.*

   Desirable: *Every atom has a central core called a(n) (nucleus) .*

2. Do not omit so many words from the statement that the intended meaning is lost.

   Undesirable: *The _____ were to Egypt as the _____ were to Persia and as _____ were to the early tribes of Israel.*

   Desirable: *The Pharaohs were to Egypt as the _____ were to Persia and as _____ were to the early tribes of Israel.*

3. Avoid grammatical or other clues to the correct response.

   Undesirable: *Most of the United States' libraries are organized according to the __(Dewey)__ decimal system.*

   Desirable: *Which organizational system is used by most of the United States' libraries? (Dewey decimal)*

4. Be sure there is only one correct response.

   Undesirable: *Trees which shed their leaves annually are (seed-bearing, common).*

   Desirable: *Trees which shed their leaves annually are called (deciduous).*

5. Make the blanks of equal length.

   Undesirable: *In Greek mythology, Vulcan was the son of __(Jupiter)__ and (Juno) .*

   Desirable: *In Greek mythology, Vulcan was the son of (Jupiter) and (Juno) .*

6. When possible, delete words at the end of the statement after the student has been presented a clearly defined problem.

   Undesirable: *__(122.5)__ is the molecular weight of $KClO_3$.*

   Desirable: *The molecular weight of $KClO_3$ is __(122.5)__ .*

7. Avoid lifting statements directly from the text, lecture or other sources.

8. Limit the required response to a single word or phrase.

ESSAY TEST ITEMS

The essay test is probably the most popular of all types of teacher-made tests. In general, a classroom essay test consists of a small number of questions to which the student is expected to demonstrate his/her ability to (a) recall factual knowledge, (b) organize this knowledge and (c) present the knowledge in a logical, integrated answer to the question. An essay test item can be classified as either an extended-response essay item or a short-answer essay item. The latter calls for a more restricted or limited answer in terms of form or scope. An example of each type of essay item follows.

Sample Extended-Response Essay Item

Explain the difference between the S-R (Stimulus-Response) and the S-O-R (Stimulus-Organism-Response) theories of personality. Include in your answer (a) brief descriptions of both theories, (b) supporters of both theories and (c) research methods used to study each of the two theories. (10 pts. 20 minutes)

Sample Short-Answer Essay Item

Identify research methods used to study the S-R (Stimulus-Response) and S-O-R (Stimulus-Response-Organism) theories of personality. (5 pts. 10 minutes)

Advantages in Using Essay Items

Essay items ...

- ... are easier and less time consuming to construct than are most other item types.
- ... provide a means for testing student's ability to compose an answer and present it in a logical manner.
- ... can efficiently measure higher order cognitive objectives (e.g., analysis, synthesis, evaluation).

Limitations in Using Essay Items

Essay items ...

- ... cannot measure a large amount of content or objectives.
- ... generally provide low test and test scorer reliability.
- ... require an extensive amount of instructor's time to read and grade.
- ... generally do not provide an objective measure of student achievement or ability (subject to bias on the part of the grader).

SUGGESTIONS FOR WRITING ESSAY TEST ITEMS

1. Prepare essay items that elicit the type of behavior you want to measure.

   Learning Objective: The student will be able to explain how the normal curve serves as a statistical model.

   Undesirable: *Describe a normal curve in terms of: symmetry, modality, kurtosis and skewness.*

   Desirable: *Briefly explain how the normal curve serves as a statistical model for estimation and hypothesis testing.*

2. Phrase each item so that the student's task is clearly indicated.

   Undesirable: *Discuss the economic factors which led to the stock market crash of 1929.*

   Desirable: *Identify the three major economic conditions which led to the stock market crash of 1929. Discuss briefly each condition in correct chronological sequence and in one paragraph indicate how the three factors were interrelated.*

3. Indicate for each item a point value or weight and an estimated time limit for answering.

   Undesirable: *Compare the writings of Bret Harte and Mark Twain in terms of settings, depth of characterization, and dialogue styles of their main characters.*

   Desirable: *Compare the writing of Bret Harte and Mark Twain in terms of settings, depth of characterization and dialogue styles of their main characters. (10 points 20 minutes)*

4. Ask questions that will elicit responses on which experts could agree that one answer is better than another.

5. Avoid giving the student a choice among optional items as this greatly reduces the reliability of the test.

6. It is generally recommended for classroom examinations to administer several short-answer items rather than only one or two extended-response items.

SUGGESTIONS FOR SCORING ESSAY ITEMS

1. Choose a scoring model. Two of the more common scoring models are ANALYTICAL SCORING and GLOBAL QUALITY.

   ANALYTICAL SCORING: Each answer is compared to an ideal answer and points are assigned for the inclusion of necessary elements. Grades are based on the number of accumulated points either absolutely (i.e., A=10 or more points, B=6-9 pts., etc.) or relatively (A=top 15% scores, B=next 30% of scores, etc.)

   GLOBAL QUALITY: Each answer is read and assigned a score (e.g., grade, total points) based either on the total quality of the response or on the total quality of the response relative to other student answers.

Example Essay Item and Grading Models

"Americans are a mixed-up people with no sense of ethical values. Everyone knows that baseball is far less necessary than food and steel, yet they pay ball players a lot more than farmers and steelworkers."

WHY? Use 3-4 sentences to indicate how an economist would explain the above situation

Analytical Scoring

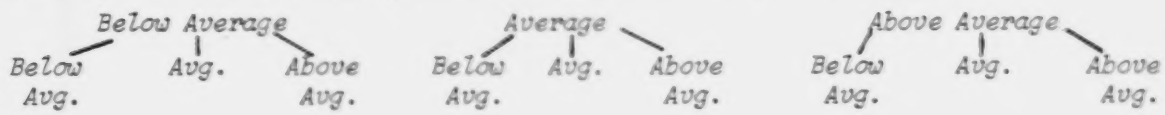
Necessary Elements to be Included in Response	*Points*
Salaries are based on demand relative to supply of such services.	*3*
Excellent ball players are rare.	*2*
Ball clubs have a high demand for excellent players.	*2*
Clarity of Response	*2*
	9 pts.

Global Quality

Assign scores or grades on the overall quality of the written response as compared to an ideal answer. Or, compare the overall quality of a response to other student responses by sorting the papers into three stacks:

Below Average *Average* *Above Average*

Read and sort each stack again and divide into three more stacks.



In total, nine discriminations can be used to assign test grades in this manner. The number of stacks or discriminations can vary to meet your needs.

2. Try not to allow factors which are irrelevant to the learning outcomes being measured affect your grading (i.e., handwriting, spelling, neatness).

3. Read and grade all class answers to one item before going on to the next item.

4. Read and grade the answers without looking at the students' names to avoid possible preferential treatment.

5. Occasionally shuffle papers during the reading of answers to help avoid any systematic order effects (i.e., Sally's "B" work always followed Jim's "A" work thus it looked more like "C" work).

6. When possible, ask another instructor to read and grade your students' responses.

PROBLEM SOLVING TEST ITEMS

Another form of a subjective test item is the problem solving or computational exam question. Such items present the student with a problem situation or task and require a demonstration of work procedures and a correct solution, or just a correct solution. This kind of test item is classified as a subjective type of item due to the procedures used to score item responses. Instructors can assign full or partial credit to either correct or incorrect solutions depending on the quality and kind of work procedures presented. An example of a problem solving test item follows.

Example Problem Solving Test Item

It was calculated that 75 men could complete a strip on a new highway in 70 days. When work was scheduled to commence, it was found necessary to send 25 men on another road project. How many days longer will it take to complete the strip? Show your work for full or partial credit.

Advantages in Using Problem Solving Items

Problem solving items ...

- ... minimize guessing by requiring the students to provide an original response rather than to select from several alternatives.
- ... are easier to construct than are multiple-choice or matching items.
- ... can most appropriately measure learning objectives which focus on the ability to apply skills or knowledge in the solution of problems.
- ... can measure an extensive amount of content or objectives.

Limitations in Using Problem Solving Items

Problem solving items ...

- ... generally provide low test and test scorer reliability.
- ... require an extensive amount of instructor time to read and grade.
- ... generally do not provide an objective measure of student achievement or ability (subject to bias on the part of the grader when partial credit is given).

SUGGESTIONS FOR WRITING PROBLEM SOLVING TEST ITEMS

1. **Clearly identify and explain the problem.**

   Undesirable: *During a car crash, the car slows down at the rate of 490 m/sec^2. What is the magnitude and direction of the force acting on a 100-kg driver?*

   Desirable: *During a car crash, the car slows down at the rate of 490 m/sec^2. Using the car as a frame of reference, what is the magnitude and direction of the gram force acting on a 100-kg driver?*

2. **Provide directions which clearly inform the student of the type of response called for.**

   Undesirable: *An American tourist in Paris finds that he weighs 70 kilograms. When he left the United States he weighed 144 pounds. What was his net change in weight?*

   Desirable: *An American tourist in Paris finds that he weighs 70 kilograms. When he left the United States he weighed 144 pounds. What was his net weight change in pounds?*

3. **State in the directions whether or not the student must show his/her work procedures for full or partial credit.**

   Undesirable: *A double concave lens is made of glass with n = 1.50. If the radii of curvature of the two lens surfaces are both 30.0 cm, what is the focal length of the lens?*

   Desirable: *A double concave lens is made of glass with n = 1.50. If the radii of curvature of the two lens surfaces are both 30.0 cm, what is the focal length of the lens? Show your work to receive full or partial credit.*

4. **Clearly separate item parts and indicate their point values.**

   A man leaves his home and drives to a convention at an average rate of 50 miles per hour. Upon arrival, he finds a telegram advising him to return at once. He catches a plane that takes him back at an average rate of 300 miles per hour.

   Undesirable: *If the total traveling time was 1 3/4 hours, how long did it take him to fly back? How far from his home was the convention?*

   Desirable: *If the total traveling time was 1 3/4 hours:*

   (1) How long did it take him to fly back? (1 pt.)

   (2) How far from his home was the convention? (1 pt.)

   Show your work for full or partial credit.

5. Use figures, conditions and situations which create a realistic problem.

   Undesirable: *An automobile weighing 2,840 N (about 640 pounds) is traveling at a speed of 300 miles per hour. What is the car's kinetic energy? Show your work. (2 pts.)*

   Desirable: *An automobile weighing 14,200 N (about 3200 pounds) is traveling at a speed of 12m/sec. What is the car's kinetic energy? Show your work. (2 pts.)*

6. Ask questions that elicit responses on which experts could agree that one solution and one or more work procedures are better than others.

7. Work through each problem before classroom administration to double-check accuracy.

PERFORMANCE TEST ITEMS

A performance test item is designed to assess the ability of a student to perform correctly in a *simulated situation* (i.e., a situation in which the student will be ultimately expected to apply his/her learning). The concept of *simulation* is central in performance testing; a performance test will simulate to some degree a real life situation to accomplish the assessment. In theory, a performance test could be constructed for any skill and real life situation. In practice, most performance tests have been developed for the assessment of vocational, managerial, administrative, leadership, communication, interpersonal and physical education skills in various simulated situations. An illustrative example of a performance test item is provided below.

Sample Performance Test Item

Assume that some of the instructional objectives of an urban planning course include the development of the student's ability to effectively use the principles covered in the course in various "real life" situations common for an urban planning professional. A performance test item could measure this development by presenting the student with a specific situation which represents a "real life" situation. For example,

An urban planning board makes a last minute request for the professional to act as consultant and critique a written proposal which is to be considered in a board meeting that very evening. The professional arrives before the meeting and has one hour to analyze the written proposal and prepare his critique. The critique presentation is then made verbally during the board meeting; reactions of members of the board or the audience include requests for explanation of specific points or informed attacks on the positions taken by the professional.

The performance test designed to simulate this situation would require that the student to be tested role play the professional's part, while students or faculty act the other roles in the situation. Various aspects of the "professional's" performance would then be observed and rated by several judges with the necessary background. The ratings could then be used both to provide the student with a diagnosis of his/her strengths and weaknesses and to contribute to an overall summary evaluation of the student's abilities.

Advantages in Using Performance Test Items

Performance test items ...

... can most appropriately measure learning objectives which focus on the ability of the students to apply skills or knowledge in real life situations.

... usually provide a degree of test validity not possible with standard paper and pencil test items.

... are useful for measuring learning objectives in the psychomotor domain.

Limitations in Using Performance Test Items

Performance test items ...

... are difficult and time consuming to construct.

... are primarily used for testing students individually and not for testing groups. Consequently, they are relatively costly, time consuming, and inconvenient forms of testing.

... generally provide low test and test scorer reliability.

... generally do not provide an objective measure of student achievement or ability (subject to bias on the part of the observer/grader).

SUGGESTIONS FOR WRITING PERFORMANCE TEST ITEMS

1. Prepare items that elicit the type of behavior you want to measure.
2. Clearly identify and explain the simulated situation to the student.
3. Make the simulated situation as "life-like" as possible.
4. Provide directions which clearly inform the students of the type of response called for.
5. When appropriate, clearly state time and activity limitations in the directions.
6. Adequately train the observer(s)/scorer(s) to ensure that they are fair in scoring the appropriate behaviors.

III. TWO METHODS FOR ASSESSING TEST ITEM QUALITY

This section of the booklet presents two methods for collecting feedback on the quality of your test items. The two methods include using self-review checklists and student evaluation of test item quality. You can use the information gathered from either method to identify strengths and weaknesses in your item writing.

CHECKLIST FOR EVALUATING TEST ITEMS

EVALUATE YOUR TEST ITEMS BY CHECKING THE SUGGESTIONS WHICH YOU FEEL YOU HAVE FOLLOWED.

Multiple-Choice Test Items

_____ When possible, stated the stem as a direct question rather than as an incomplete statement.

_____ Presented a definite, explicit and singular question or problem in the stem.

_____ Eliminated excessive verbiage or irrelevant information from the stem.

_____ Included in the stem any word(s) that might have otherwise been repeated in each alternative.

_____ Used negatively stated stems sparingly. When used, underlined and/or capitalized the negative word(s).

_____ Made all alternatives plausible and attractive to the less knowledgeable or skillful student.

_____ Made the alternatives grammatically parallel with each other, and consistent with the stem.

_____ Made the alternatives mutually exclusive.

_____ When possible, presented alternatives in some logical order (e.g., chronologically, most to least).

_____ Made sure there was only one correct or best response per item.

_____ Made alternatives approximately equal in length.

_____ Avoided irrelevant clues such as grammatical structure, well known verbal associations or connections between stem and answer.

_____ Used at least four alternatives for each item.

_____ Randomly distributed the correct response among the alternative positions throughout the test having approximately the same proportion of alternatives a, b, c, d, and e as the correct response.

_____ Used the alternatives "none of the above" and "all of the above" sparingly. When used, such alternatives were occasionally the correct response.

True-False Test Items

_____ Based true-false items upon statements that are absolutely true or false, without qualifications or exceptions.

_____ Expressed the item statement as simply and as clearly as possible.

_____ Expressed a single idea in each test item.

_____ Included enough background information and qualifications so that the ability to respond correctly did not depend on some special, uncommon knowledge.

_____ Avoided lifting statements from the text, lecture or other materials.

_____ Avoided using negatively stated item statements.

_____ Avoided the use of unfamiliar language.

_____ Avoided the use of specific determiners such as "all," "always," "none," "never," etc., and qualifying determiners such as "usually," "sometimes," "often," etc..

_____ Used more false items than true items (but not more than 15% additional false items).

Matching Test Items

_____ Included directions which clearly stated the basis for matching the stimuli with the response.

_____ Explained whether or not a response could be used more than once and indicated where to write the answer.

_____ Used only homogeneous material.

_____ When possible, arranged the list of responses in some systematic order (e.g., chronologically, alphabetically).

_____ Avoided grammatical or other clues to the correct response.

_____ Kept items brief (limited the list of stimuli to under 10).

_____ Included more responses than stimuli.

_____ When possible, reduced the amount of reading time by including only short phrases or single words in the response list.

Completion Test Items

_____ Omitted only significant words from the statement.

_____ Did not omit so many words from the statement that the intended meaning was lost.

_____ Avoided grammatical or other clues to the correct response.

_____ Included only one correct response per item.

_____ Made the blanks of equal length.

_____ When possible, deleted the words at the end of the statement after the student was presented with a clearly defined problem.

_____ Avoided lifting statements directly from the text, lecture or other sources.

_____ Limited the required response to a single word or phrase.

Essay Test Items

_____ Prepared items that elicited the type of behavior you wanted to measure.

_____ Phrased each item so that the student's task was clearly indicated.

_____ Indicated for each item a point value or weight and an estimated time limit for answering.

_____ Asked questions that elicited responses on which experts could agree that one answer is better than others.

_____ Avoided giving the student a choice among optional items.

_____ Administered several short-answer items rather than 1 or 2 extended-response items.

Grading Essay Test Items

_____ Selected an appropriate grading model.

_____ Tried not to allow factors which were irrelevant to the learning outcomes being measured to affect your grading (e.g., handwriting, spelling, neatness).

_____ Read and graded all class answers to one item before going on to the next item.

_____ Read and graded the answers without looking at the student's name to avoid possible preferential treatment.

_____ Occasionally shuffled papers during the reading of answers.

_____ When possible, asked another instructor to read and grade your students' responses.

Problem Solving Test Items

_____ Clearly identified and explained the problem to the student.

_____ Provided directions which clearly informed the student of the type of response called for.

_____ Stated in the directions whether or not the student must show work procedures for full or partial credit.

_____ Clearly separated item parts and indicated their point values.

_____ Used figures, conditions and situations which created a realistic problem.

_____ Asked questions that elicited responses on which experts could agree that one solution and one or more work procedures are better than others.

_____ Worked through each problem before classroom administration.

Performance Test Items

_____ Prepared items that elicit the type of behavior you wanted to measure.

_____ Clearly identified and explained the simulated situation to the student.

_____ Made the simulated situation as "life-like" as possible.

_____ Provided directions which clearly inform the students of the type of response called for.

_____ When appropriate, clearly stated time and activity limitations in the directions.

_____ Adequately trained the observer(s)/scorer(s) to ensure that they were fair in scoring the appropriate behaviors.

STUDENT EVALUATION OF TEST ITEM QUALITY

USING ICES QUESTIONNAIRE ITEMS TO ASSESS YOUR TEST ITEM QUALITY

The following set of ICES (Instructor and Course Evaluation System) questionnaire items can be used to assess the quality of your test items. The items are presented with their original ICES catalogue number. You are encouraged to include one or more of the items on the ICES evaluation form in order to collect student opinion of your item writing quality.

102--How would you rate the instructor's examination questions?

Excellent	Poor

103--How well did examination questions reflect content and emphasis of the course?

Well related	Poorly related

114--The exams reflected important points in the reading assignments.

Strongly agree	Strongly disagree

117--Examinations mainly tested trivia.

Strongly agree	Strongly disagree

119--Were exam questions worded clearly?

Yes, very clear	No, very unclear

115--Were the instructor's test questions thought provoking?

Definitely yes	Definitely no

116--Did the exams challenge you to do original thinking?

Yes, very challenging	No, not challenging

118--Were there "trick" or trite questions on tests?

Lots of them	Few if any

122--How difficult were the examinations?

Too difficult	Too easy

123--I found I could score reasonably well on exams by just cramming.

Strongly agree	Strongly disagree

121--How was the length of exams for the time allotted.

Too long	Too short

109--Were exams, papers, reports returned with errors explained or personal comments?

Almost always	Almost never

125--Were exams adequately discussed upon return?

Yes, adequately	No, not enough

IV. ASSISTANCE OFFERED BY THE OFFICE OF INSTRUCTIONAL AND MANAGEMENT SERVICES (IMS)

The information in the booklet is intended for self-instruction. However, IMS staff members will consult with faculty who wish to analyze and improve their test item writing. The staff can also consult with faculty about other instructional problems. The Measurement and Evaluation Division of IMS also publishes a quarterly newsletter called THE ANSWER SHEET which discusses various classroom testing and measurement issues. Instructors wishing to receive the newsletter or to acquire IMS assistance can call the Measurement and Evaluation Division at 333-3490.

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*The Dewey decimal numbers are those used by the University of Illinois Library.